REMARKS

This paper is being provided in response to the Advisory Action dated December 31, 2003, for the above-captioned U.S. patent application and for which a period of reply has been established by the Final Office Action dated August 22, 2003. In this response, Applicant has amended claims 1 and 9 to clarify that which Applicant considers to be the invention. Applicant respectfully submits that the amendments to the claims are fully supported by the originally-filed specification.

Applicant notes that the Advisory Action cites only the Kogler and Takekawa references. In the present response, Applicant addresses the rejections over Kogler and Takekawa in view of the amendments to the claims contained herein and further, to the extent still applicable, addresses the other references and rejections set forth in the Final Office Action dated August 22, 2003, in view of the current amendments.

The rejection of claims 1-3 and 9-11 under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,783,917 to Takekawa (hereinafter referred to as "Takekawa") in view of U.S. Patent No. 4,246,518 to Kogler (hereinafter referred to as "Kogler") is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

Independent claim 1, as amended herein, recites a method of starting a brushless DC motor including an armature coil in a stator and field magnets in a rotor. The method comprises selecting a first starting waveform from a plurality of stored waveforms independently of a

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position of the rotor, supplying a starting current having the selected first starting waveform for said armature coil while said rotor is in a stationary state, measuring an induced voltage induced in the armature coil by rotation of the rotor, wherein the rotation is caused by the starting current, and supplying a drive current for the armature coil in response to the induced voltage. Claims 2-8 depend on independent claim 1.

Independent claim 9, as amended herein, recites a brushless DC motor, comprising an armature including an armature coil, a rotor including a plurality of field magnets, a power supply unit arranged to supply current to the armature coil, and a measuring unit. The power supply unit supplies a starting current for said armature coil while said rotor is in a stationary state, and the measuring unit measures an induced voltage induced in the armature coil by rotation of the rotor, the rotation being caused by the starting current. The starting current has a waveform selected from a plurality of stored waveforms independently of a position of the rotor. The power supply unit supplies a drive current for the armature coil in response to the induced voltage. Claims 10-16 depend on independent claim 9.

The Takekawa reference discloses a DC brushless motor that runs in a synchronous mode upon startup, and switches to a position feedback system after a fixed time. (See col. 6, line 51 – col. 7, line 15 of Takekawa.) In synchronous mode, power is delivered to the motor coils according to a fixed, predetermined schedule, without using a feedback sensor. The fixed time is selected to be long enough to assure that the motor has started in synchronous mode and is running at a sufficiently high speed that its position can be detected. (See col. 7, lines 5-10 of Takekawa.)

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The Kogler reference discloses a DC brushless motor that may be operated in a stepping mode. Two Hall effect sensors (H1, H2) determine the position of the rotor (within one of four quadrants). One of four phase windings (W1, W2, W3, W4) may be energized to move the rotor from one quadrant to the next. A selection circuit (5) uses the two Hall effect sensors to determine which phase winding to energize in order to move the rotor into the next quadrant. This signal is held in a storage element (2) until it is sent to the commutator by clocking the storage element.

Applicant's independent claims, as amended herein, recite at least the features of a brushless DC motor in which a *first starting waveform is selected from a plurality of stored waveforms independently of a position of said rotor*, and a starting current having the selected first starting waveform is supplied to the armature coil while the rotor is in a stationary state. Applicant recites that before a brushless DC motor is started and before a position of the rotor can be detected, a first starting waveform is selected from a plurality of stored waveforms and a starting current having the selected first starting waveform is supplied to the armature coil while said rotor is in a stationary state. Applicant has found that a brushless DC motor and method of starting according to the present claimed invention reduces the time necessary for actuation. (See, for example, page 13, lines 9-22 and page 22, lines 21-26 of the present application.)

Applicant respectfully submits that neither Kogler nor Takekawa, taken alone or in any combination, teach or fairly suggest at least the above-noted features as claimed by Applicant. Specifically, Kogler discloses that when the motor is started, the memory is cleared and the rotor

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is moved to a predetermined starting position. Operation is delayed until the rotor reaches the predetermined starting position. (See, for example, col. 5, lines 53-59 of Kogler.) Further, Takekawa discloses acceleration of a rotor at start up according to a high level output pulse signal PS that is maintained for a fixed period of time. (See, for example, col. 7, lines 5-15 of Takekawa).

Applicants respectfully submit that the prior art of record does not teach or fairly suggest at least the features of a brushless DC motor in which a first starting waveform is *selected from a plurality of stored waveforms independently of a position of said rotor*, and a starting current having the selected first starting waveform is supplied to the armature coil while the rotor is in a stationary state, as claimed by Applicant. Accordingly, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

The rejection of claims 1, 2, 4, 9, 10 and 12 under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,245,256 to Cassat (hereinafter referred to as "Cassat") in view of Kogler is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

Independent claims 1 and 9 are discussed above. Claims 2, 4, 10 and 12 depend thereon.

The Kogler reference is discussed above.

The Cassat reference discloses a brushless DC motor that uses excitation current and back EMF to control the speed of the motor after startup. The motor must be started and accelerated to a nominal speed before the device of Cassat can operate; Cassat does not describe a startup method (see col. 7, lines 61-66 of Cassat).

Applicant respectfully submits that Cassat does not overcome the above-noted deficiencies of the Kogler reference with respect to Applicant's claims. Specifically, Cassat does not disclose a startup method for a motor, rather, Cassat's device operates once the motor has started up and accelerated to a nominal speed. As discussed above, Kogler discloses starting up a motor according to a predetermined position of the rotor. Applicant respectfully submits that neither Cassat nor Kogler, taken alone or in combination, teach or fairly suggest at least the features of a brushless DC motor in which a first starting waveform is *selected from a plurality of stored waveforms independently of a position of said rotor*, and a starting current having the selected first starting waveform is supplied to the armature coil while the rotor is in a stationary state, as claimed by Applicant. Accordingly, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

The rejection of claims 1, 5-7, 9, and 13-15 under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,744,921 to Makaran (hereinafter referred to as "Makaran") in view of Kogler is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

Independent claim 1 and 9 are discussed above. Claims 5-7 and 13-15 depend thereon.

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The Kogler reference is discussed above.

The Makaran reference discloses a control circuit for a five-phase brushless DC motor. The rotor is started from a standstill using a predetermined sequence of energization of the motor windings. (See col. 8, lines 27-46of Makaran.) If the rotor is already rotating in the wrong direction at startup, the rotor is stopped at a predetermined position, where a known sequence of currents can be used to start the motor in the correct direction. (See col. 8, lines 13-26 and Fig. 4 of Makaran.)
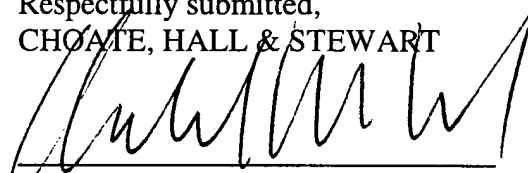
Applicants respectfully submit that Makaran does not overcome the above-noted deficiencies of Kogler with respect to Applicant's claims. Specifically, Makaran discloses that a predetermined single sequence is used to start a rotor and, as discussed above, Kogler discloses starting up a motor according to a predetermined position of the rotor. Applicant respectfully submits that neither Makaran nor Kogler, taken alone or in any combination, teach or fairly suggest at least the features of a brushless DC motor in which a first starting waveform is *selected from a plurality of stored waveforms independently of a position of said rotor*, and a starting current having the selected first starting waveform is supplied to the armature coil while the rotor is in a stationary state, as claimed by Applicant. Accordingly, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

The rejection of claims 8 and 16 under 35 U.S.C. 103(a) as being unpatentable over the combination of Makaran and Kogler is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

Claims 8 and 16 depend, respectively, on independent claims 1 and 9, discussed above. Kogler and Makaran are both discussed above with respect to independent claims 1 and 9. Accordingly, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

Based on the above, Applicant respectfully requests that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 617-248-4038.

Respectfully submitted,
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